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Dear Student, Artist, Thinker,

The ocean has long been one of the more mysterious realms of our planet, which is weird when you consider that 70% of the Earth is covered by oceans and we've been exploring them for thousands of years. In ages past, sailors and mariners brought home with them tales of mermaids, sea monsters, and ghost ships from Davy Jones' Locker (a sailor's metaphor for the bottom of the sea).

Today, many of those mysteries have been revealed. Scientists believe that it was actually manatees that were mistaken for mermaids, and reports of the infamous and many-tentacled Kraken were likely exaggerations from those who witnessed giant squids, which are admittedly pretty big, but nowhere near large enough to wrap themselves around (let alone sink) the average ocean-faring ship. As for ghost ships, they seem to only exist inside *Pirates of the Caribbean* movies.

Still, the mysteries that remain are rather interesting. While humans have technically mapped the ocean floor, it is a very low-resolution map — we have a better picture of the surface of Mars than the bottom of the ocean; in fact, 95% of the ocean floor has never been seen by human eyes. Oceanographers and marine biologists are still discovering new species that are able to survive at great depths, such as the *Blobus purpilis*, a recently found, er, purple blob (scientists think it may be a kind of snail or sea slug, but they're not sure). And we hear weird noises down there too, like the 1997 "Bloop" sound recorded in the South Pacific. It was a very loud and very low frequency sound, which scientists believe resulted from an iceberg breaking off from a glacier a long ways away.

At any rate, while astronauts and *Star Trek* fans may consider outer space to be the final frontier, there is plenty left to be explored right here on Earth. If, that is, the explorers are willing to get a little wet. We hope you enjoy exploring this issue!

Kyes Stevens and the APAEP Team

WORDS INSIDE

FROM "WHAT'S THE TOTAL VALUE"...
manifests | documents giving comprehensive details of a ship and its cargo and other contents, passengers, and crew

autonomous | denoting or performed by a device capable of operating without direct human control

FROM "WELCOME TO CHALLENGER DEEP"...
phosphorescence | light emitted by a substance without combustion; often what causes something to "glow in the dark"

hadal | relating to the zone of the sea greater than approximately 20,000 feet in depth

FROM "GLOBAL HEATING SUPERCHARGING"...
susceptible | liable to be influenced or harmed by a particular thing

eroded | to have gradually been destroyed

• • •

"We know only too well that what we are doing is nothing more than a drop in the ocean. But if the drop were not there, the ocean would be missing something." **MOTHER TERESA** // Albanian-Indian nun and missionary

CLIMATE

Global Heating Supercharging Indian Ocean Climate System

BY PETER BEAUMONT AND GRAHAM READFEARN | *The Guardian* | Nov 19, 2019

Global heating is "supercharging" an increasingly dangerous climate mechanism in the Indian Ocean that has played a role in recent disasters including bushfires in Australia and floods in Africa.

Scientists and humanitarian officials say this year's record Indian Ocean dipole, as the phenomenon is known, threatens to reappear more regularly and in a more extreme form as sea surface temperatures rise.

Of most concern are years in which the sea surface off the coast of Africa warms up, provoking increased rains, while temperatures off Australia fall, leading to drier weather.

It is similar to El Niño and La Niña in the Pacific, which cause sharp changes in weather patterns on both sides of the ocean.

Caroline Ummenhofer, a scientist at Woods Hole Oceanographic Institution in Massachusetts who has been a key figure in efforts to understand the importance of the dipole, said unique factors were at play in the Indian Ocean compared with other tropical regions.

While ocean currents and winds in the Atlantic and Pacific can disperse heating water, the large Asian landmass to the north of the Indian Ocean makes it particularly susceptible to retaining heat. "It's quite different to the tropical Atlantic and tropical Pacific events. There you have steady easterly trade winds. In the Indian Ocean that's not the case," Ummenhofer said.

"There is a certain season where you have easterly winds. Otherwise you have seasonally reversing monsoon winds, which makes for very different dynamics."

Recent research suggests ocean heat has risen dramatically over the past decade, leading to the potential for warming water in the Indian Ocean to affect the Indian monsoon, one of the most important climate patterns in the world.

Ummenhofer said warming appeared to be "supercharging" mechanisms already existing in the background. "The Indian Ocean is particularly sensitive to a warming world. It is the canary in the coalmine seeing big changes before others come to other tropical ocean areas."

Australian climatologists have pointed to 2019's dipole as at least one of the contributing factors in last year's bushfires. Jonathan Pollock, of Australia's Bureau of Meteorology, said the dipole was "up there as one of the strongest" on record.

Gemma Connell, of the UN's Office for the Coordination of Humanitarian Affairs, raised concern over the impact of stronger and more regular Indian Ocean dipole events on Africa.

"What we are seeing from the current record events is large-scale flooding across the region. Entire swathes are under water, affecting 2.5 million people," she said.

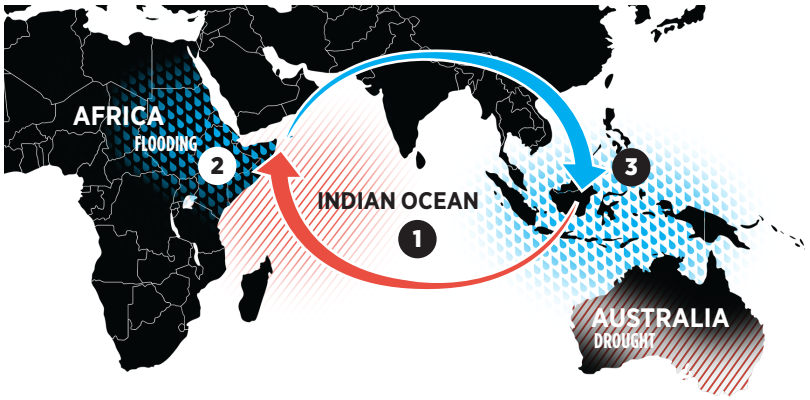
"And putting it in the broader picture of the climate crisis, this flooding is coming on the back of two droughts. What we are seeing, and what we are going to see more of, is more frequent climatic shocks coming. And all that is on top of the violence and conflict that has already displaced many of the people involved.

"In Kenya, for example, the region hardest hit has been around Lake Turkana, where there are already global malnutrition rates above 30% following drought. People are trying to cope with back-to-back shocks and their resilience has been eroded."

Another concern for Connell and other humanitarian officials is that although climate scientists are racing to try to develop predictive modelling, there is disagreement over whether stronger Indian Ocean dipole events will lead to a wetter climate for Africa or a drier one.

"As non-meteorologists trying to plan ahead, we're being faced with complex and changing scenarios. We're just running to keep up. Looking now at southern and eastern Africa, with failed rainy seasons and then flooding, none of it looks normal," she said.

"The new normal is a severe weather event. Looking at the Indian Ocean dipole's effects, you have to see this is as a preview of what can be expected in other parts of world. And while I'm not surprised that attention of the world is elsewhere, that is still unforgivable given how many are suffering from a phenomenon the rest of the world helped create." ●



1. In a warming world the western Indian Ocean heats up more than the eastern Indian Ocean

Atmospheric circulation and rainfall distribution are altered by the difference in these two ocean temperatures

2. Rising warm, moist air in the west leads to rainfall that can cause devastating floods in east African countries

3. Less warm air rises in the eastern Indian Ocean because the waters are cooler. This results in less rain, causing drought and exreme fire conditions in Australia

The Commonwealth Scientific and Industrial Research Organisation

Edited for space and clarity

ECONOMICS

What's the Total Value of the World's Sunken Treasure?

BY ROB GOODIER | *Popular Mechanics* | Feb 22, 2012

The team that announced the discovery of the *Port Nicholson*, a World War II–era British merchant ship found 50 miles off the coast of Maine, says it bore 71 tons of platinum ingots worth about $3 billion. Other shipwreck hunters turned up the HMS *Victory*, which sank in the English Channel in 1744 with a "secret" cargo of gold valued at $1 billion. And, in an episode that shows the high stakes of shipwreck salvaging, Spain is currently recovering the estimated $500 million haul of gold and silver from the Spanish galleon *Nuestra Señora de las Mercedes* that sank in 1804; an American company found the ship but lost court cases to Spain over the rights to the treasure.

All this undersea treasure hunting got us wondering: Just how much money is out there buried at sea?

An estimate of the value of sunken treasure in the world begins with a guess at the number of sunken ships. James Delgado, director of the Maritime Heritage Program at the National Oceanic and Atmospheric Administration (NOAA), estimates that there are a million shipwrecks underwater now.

"Given everything that's charted and all the rest, I would say that the majority of them remain undiscovered," Delgado says. After all, 70 percent of the planet's surface is water, and humans have only begun to be able to reach the depths. "[Considering] this, 95 percent of the ocean still remains unknown to us. It's the last frontier," Delgado says. "We know more about the surface of the moon than what's at the bottom of the sea."

Maritime historian Amy Mitchell-Cook at the University of West Florida says she doesn't think it's possible to make an estimate. "Even in Pensacola Bay, where I am, I don't think we have an accurate number of shipwrecks," she says. "There were Spanish, French, English, and Americans all in the area, as well as international trade. We know a lot of ships sank, but we don't have a complete set of records."

How much treasure is down there? The short answer, Sean Fisher says, is $60 billion. Fisher is a shipwreck hunter at Mel Fisher's Treasures in Key West (Sean is Mel's grandson), and he gives this figure based on his company's historical research. Fisher specializes in finding Spanish vessels that sank while toting gold, silver, and other loot from the Americas to Europe. And the Spaniards, Fisher says, kept records in triplicate, allowing modern-day shipwreck hunters to see the preserved ship manifests.

"For about 300 years, the Spaniards came over here and stole all of the wealth of the Americas," Fisher says. "They would lose about 10 percent of that as the cost of doing business. Several wrecks out there by themselves are worth several billion dollars."

Don't be fooled by the flashy dollars figures, Mitchell-Cook argues—we can't know how much wealth is at the bottom of the sea, but it's not enough to make it worth your time.

There's no documentation for many shipwrecks and disappearances, Mitchell-Cook says. And there's no way to know what happened to the wreck. And then there's the question of whether you can keep what you find. Governments, insurance companies, and anyone with a chance at a legal claim will set their sights on recovered treasure.

Most of the still-undiscovered wrecks are deep, Delgado says. To get to them, divers need rebreathers and gas mixtures that extend their range and decrease decompression times. When they're too deep or dangerous for divers, autonomous underwater vehicles outfitted with cameras and excavation tools do the exploring and heavy lifting.

But first you have to know where to look, and the hunt begins with historical research. It's like detective work, Mitchell-Cook says. A maritime historian like her would plug that information into a renavigation program that uses local wind speeds, currents, the sightings of the fleets at the time the ship was lost, and whatever other information is available to narrow a search area where the wreck will most likely be.

"All material goods hold value to archaeologists and historians, whether it is a small piece of rope, a broken bottle, or even a nail," Mitchell-Cook says.

The historians we contacted are unanimous in their condemnation of treasure hunters who destroy the historical record. One museum director even declined to talk about the value of undersea wrecks for fear of encouraging looters.

"The value of shipwrecks is actually priceless in the true sense of the word," Delgado says, "because they tell us our story about our forgotten past. They're not a commodity to be bought and sold; they're something that gives voice to what was forever silenced." ●

?

WITHIN MY SHELL, GREAT SECRETS I HOLD

OPEN ME UP AND THE TRUTH SHALL BE TOLD

I TYPICALLY DRIFT, FORGOTTEN BY MOST

FLOATING ALONG 'TIL I FIND A NEW COAST

AND IF I DO PERISH BEFORE I AM FOUND

MY EXISTENCE IS MEANINGLESS, MY PURPOSE IS DROWNED

I'LL WITHER AWAY AMONGST THE DEBRIS

MY SECRET DECAYED SO NO ONE SHALL SEE

WHAT AM I?

reddit.com

Edited for space

MATHEMATICS

Sudoku

#71 PUZZLE NO. 2959119

			7	8		1		4
5			9	4		6		
1							8	
8		3	2	5				
	1							
4				6			3	
9		7				5		
							2	
			4			8	6	

©Sudoku.cool

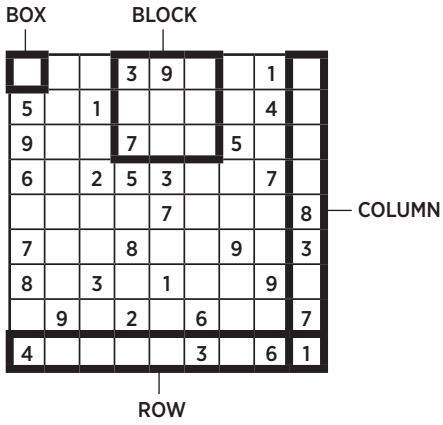
#72 PUZZLE NO. 8270740

	9				7	5	8	
				5				
3				9			4	1
5						6		
		7		1		4		
4	6	1	2			9		
	8							
		2		4				
					9	2	5	

©Sudoku.cool

SUDOKU HOW-TO GUIDE

1. Each block, row, and column must contain the numbers 1–9.
2. Sudoku is a game of logic and reasoning, so you should not need to guess.
3. Don't repeat numbers within each block, row, or column.
4. Use the process of elimination to figure out the correct placement of numbers in each box.
5. The answers appear on the last page of this newsletter.



What the example will look like solved

2	4	8	3	9	5	7	1	6
5	7	1	6	2	8	3	4	9
9	3	6	7	4	1	5	8	2
6	8	2	5	3	9	1	7	4
3	5	9	1	7	4	6	2	8
7	1	4	8	6	2	9	5	3
8	6	3	4	1	7	2	9	5
1	9	5	2	8	6	4	3	7
4	2	7	9	5	3	8	6	1

"It is an interesting biological fact that all of us have in our veins the exact same percentage of salt in our blood that exists in the ocean, and, therefore, we have salt in our blood, in our sweat, in our tears. We are tied to the ocean. And when we go back to the sea — whether it is to sail or to watch it — we are going back from whence we came."

JOHN F. KENNEDY // 35th President of the United States

DID YOU KNOW?

The sun gives the ocean its blue tint. The color is the result of the sun's red and orange wavelengths being absorbed by the surface and its blue wavelengths penetrating deeper, giving way to a **blue tint**. And because those wavelengths can travel farther down, the ocean will tend to appear more blue the lower you go.

The Denmark Strait, a **waterfall below the Atlantic Ocean**, is the equivalent of 2,000 of the world's most notable waterfalls, with cascading liquid pouring 11,500 feet down. The Strait's cold water on the eastern side is more dense than the warm fluid coming from the west. When the two waters mix, the colder supply sinks, creating a waterfall.

The majority of life on Earth is aquatic. An incredible **94% of the Earth's living species** exist within the oceans.

trafalgar.com and mentalfloss.com

Idiom

"A sea change"

Meaning A radical change or transformation

Origin From Shakespeare's *The Tempest*, 1610:

ARIEL [sings]:
Full fathom five thy father lies;
Of his bones are coral made;
Those are pearls that were his eyes:
Nothing of him that doth fade
But doth suffer a sea-change
Into something rich and strange.
Sea-nymphs hourly ring his knell

Shakespeare's usage incorporates the current meaning, that is, a radical change. He also made the expression richer by alluding to the literal meaning of 'a change that is brought about by the sea'.

Source: phrases.org.uk

ACCORDING TO THE WORLD REGISTER OF MARINE SPECIES THERE ARE NOW 240,470 ACCEPTED SPECIES, BUT THIS IS BELIEVED TO BE JUST A SMALL PROPORTION OF THE SPECIES THAT EXIST, WITH **NEW MARINE LIFE BEING DISCOVERED EVERY DAY**.

THE EARTH'S MOST REMOTE PLACE IS IN THE SOUTH PACIFIC. KNOWN AS POINT NEMO, THE AREA IS ROUGHLY **1000 EQUIDISTANT MILES** AWAY FROM THE COASTS OF THREE NEIGHBORING ISLANDS. IT'S SO REMOTE THAT ASTRONAUTS ARE OFTEN CLOSER TO ANY THEORETICAL OCCUPANTS THAN ANYONE ON DRY LAND.

IT'S POSSIBLE TO FIND **RIVERS AND LAKES BENEATH THE OCEAN**. WHEN SALT WATER AND HYDROGEN SULFIDE COMBINE, IT BECOMES DENSER THAN THE REST OF THE WATER AROUND IT, ENABLING IT TO FORM A LAKE OR RIVER THAT FLOWS BENEATH THE SEA.

Icons from the Noun Project

ART + CULTURE

If the ocean had a mouth

BY MARIE-ELIZABETH MALI

I'd lean close, my ear
to her whisper and roar,
her tongue scattered
with stars.

She'd belt her brassy voice
over the waves' backbeat.
No one sings better than her.

Would she ever bite
the inside of her cheek?

Would she yell at the moon
to quit tugging at her hem,
or would she whistle, drop
her blue dress and shimmy
through space to cleave
to that shimmer?

What did she mean to say
that morning she spit out
the emaciated whale
wearing a net for a corset?

All this emptying
on the sand. Eyeless
shrimp. Oiled pelicans.

Within her jaws the coral forests,
glittering fish, waves like teeth,
her hungry mortal brine.

This poem appeared in *Poem-A-Day* on March 26, 2014.

WRITING PROMPT

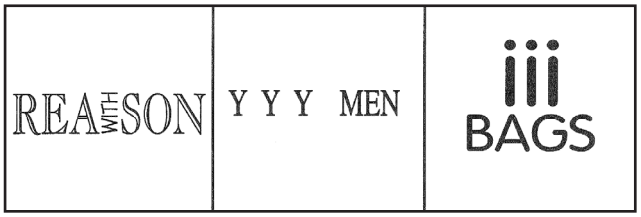
Anthropomorphism (the technical word for when we make a non-human thing behave like a human) is a wonderful poetic technique that grows our imagination. Pick a non-human thing (like the ocean, or the wind, or a jacket, or a lightbulb) and give it some humanity. How would it behave? What would it be concerned with? What would it want?

Marie-Elizabeth Mali was born and raised in New York City, with frequent trips to Venezuela and Sweden where most of her family lives. She is the author of *Steady, My Gaze* (2011) and co-editor with Annie Finch of the anthology, *Villanelles* (2012). She earned a BA in East Asian Studies from Oberlin College, a Masters degree from Pacific College of Oriental Medicine, and an MFA in poetry from Sarah Lawrence College. She has practiced Traditional Chinese Medicine, has curated several reading series, and has served as a poetry editor at *TIFERET: A Journal of Spiritual Literature.*

Word Search

R	A	E	R	L	A	S	S	I	G	J	S	M	R
H	H	M	P	E	L	I	C	A	N	S	C	P	B
A	I	A	E	T	A	H	N	E	C	N	L	M	R
B	L	M	C	F	S	A	E	T	Y	P	O	I	I
R	E	F	S	I	G	I	R	M	S	A	S	R	N
I	A	L	M	S	E	R	A	Y	S	E	E	H	B
N	N	H	J	H	S	H	M	S	A	E	V	S	R
E	S	N	A	T	C	M	D	M	R	R	R	S	H
S	D	R	H	O	I	L	S	I	B	I	L	Y	T
P	J	E	R	H	J	S	C	W	H	A	L	E	Y
A	N	A	S	A	S	T	S	E	S	V	E	Y	G
S	L	N	W	R	R	S	G	N	S	S	C	T	W
W	A	S	N	W	S	A	N	D	S	E	V	A	W
A	L	O	P	G	L	I	T	T	E	R	I	N	G

WHALE
SAND
CORAL
EAR
FISH
LEAN
SHIMMY
HEM
JAWS
GLITTERING
SHRIMP
BRASSY
BRINE
CLOSE
PELICANS
WAVES



WORD PLAY

A Rebus puzzle is a picture representation of a common word or phrase. How the letters/images appear within each box will give you clues to the answer! For example, if you saw the letters "LOOK ULEAP," you could guess that the phrase is "Look before you leap." *Answers are on the last page!*

SPORTS

The Biggest Wave Surfed This Year

BY ADAM SKOLNICK | *The New York Times* | September 22, 2020

Every winter, the cliffs along Nazaré, a Portuguese fishing port north of Lisbon, become a grandstand for spectators watching daredevil surfers drop into the tallest waves on earth.

On Feb. 11, they witnessed yet another world-record wave, this one ridden by the 33-year-old Brazilian Maya Gabeira, a surfer who almost lost her life to the same wave.

Gabeira and her tow partner, Sebastian Steudtner of Germany, were in the lineup in Portugal to compete in the men's team event at the Nazaré Tow Surfing Challenge. Gabeira, the only woman surfing in the men's field, was in perfect position when the biggest set of the day rolled in.

"I was in the zone," she said this month from her home in Nazaré. "More brave than I am usually. I got really close to disaster."

Gabeira gripped the tow rope as Steudtner gunned their jet ski to 50 miles per hour, slinging her onto the lip of a cresting giant.

She flew down the face of the wave as it curled overhead then crashed in a series of what felt like explosions, Gabeira said, before engulfing her body in white water.

"I had never been so close to such a powerful explosion," she said. "I had never felt that energy and that noise. It felt really terrifying."

This month, a team of private wave engineers and scientists with the Scripps Institution of Oceanography and the University of Southern California Department of Aerospace and Mechanical Engineering determined the wave Gabeira rode that day was 73.5 feet, smashing her own previous record by more than five feet.

It wasn't just the biggest wave ever ridden by a woman. It was the biggest wave surfed by anyone during the 2019-20 winter season, a first for women in professional surfing.

"I think it's really important for the next generation of girls growing up to see women accomplishing these things," said Paige Alms, 32, one of the world's best big wave surfers. "You can only really dream as big as what you can see."

For tow-in surfers like Gabeira who pursue such gargantuan waves, there is a crucial teamwork element. Tow surfers need a skilled driver on the jet ski, armed with a radio to communicate with a cliffside spotter to help determine where and when the next monster might rise, and where they need to be to catch it. In tow contests, the jet ski driver splits the purse with a winning surfer.

In 2013, Gabeira wiped out on a 50-foot wave and was held underwater for several minutes. She was barely conscious when she grabbed a dangling tow rope, only to be dragged toward shore facedown, getting pulled from the water without a pulse. CPR saved her life, but she had snapped her right fibula and herniated a disk in her lower back.

Maya Gabeira surfs a record-breaking 73.5 foot wave in Portugal

Image by Getty Images

Her recovery took four years and three back surgeries. She lost all of her sponsors, dealt with an anxiety disorder and panic attacks, and was scolded publicly and warned privately by legends of her sport, including Laird Hamilton, who publicly criticized her after her 2013 accident.

In 2015, Gabeira moved to Nazaré full time, and by 2018 she had set a world record for women after riding a 68-foot wave at the same break.

Women have long faced doubt, dismissal and outright denial that they belong in the lineup among big wave chargers. They have seldom had access to the kind of sponsorship it takes to chase swells.

"Of the top 10 big wave women in the world, there's three getting paid," Alms said. "The top 10 male big wave surfers own homes, travel year-round and bring their families with them."

"I'm just happy that a woman surfed the biggest wave of the year," Gabeira said. "It's possible. Other women can do it.

"I like to make something that seems so impossible to be possible. Because then it's so much easier for the next one." ●

Edited for space

WHAT CONSTANTLY BREAKS BUT NEVER STAYS BROKEN?

WHAT WON'T BREAK IF YOU THROW IT OFF THE HIGHEST BUILDING IN THE WORLD, BUT WILL BREAK IF YOU PLACE IT GENTLY IN THE OCEAN?

Rob Hitt and riddles.com

EXPLORATION

Welcome to Challenger Deep, the Deepest Part of the Ocean

BY GINA DIMURO | *Allthatsinteresting.com* | Updated August 29, 2019

On January 23, 1960, Swiss oceanographer Jaques Piccard and U.S. Navy Lieutenant Don Walsh had the unique experience of exploring a place no human in history had been before: the deepest part of the ocean, now known as Challenger Deep.

Navigating from within a cramped, pressurized sphere, the two men sat huddled together, barely moving for nearly five hours as they made their descent to the bottom of the Mariana Trench in the western Pacific some 200 miles southeast of Guam.

The world outside of their porthole was illuminated by a powerful light, although as they continued their journey all sunlight and color slowly evaporated until they were left in complete blackness apart from the illumination of their own beam. The eerie silence was only penetrated by conversation and, as Piccard recalled, "crackling sounds, like ants in an ant hill, little cracking sounds coming from everywhere."

When they finally reached their goal, the two men hesitantly attempted to contact their team back at base using a specially-constructed communication device. They were unsure they would even succeed because no communication of this type had ever been attempted before.

To their surprise and relief, a voice from the other end of the line replied, "I hear you weakly but clearly. Please repeat the depth." Walsh triumphantly responded, "Six three zero zero fathoms" — some seven miles below the surface of the sea.

A Dive Into Challenger Deep

Piccard and Walsh's voyage to the deep had occurred during the much more widely-celebrated Space Age, a decade when humans were leaving Earth's boundaries and treading on the moon. Yet where the two men had explored, Challenger Deep, was arguably the real last frontier.

Challenger Deep — the deepest point in the Mariana Trench, which is itself the deepest part of the ocean — is therefore the deepest point on Earth, more than 36,000 feet below the ocean's surface. For scale, if Mount Everest, the highest point on Earth, were dropped into Challenger Deep, its summit would still not breach the surface — by well over a mile.

Oceanic trenches of this magnitude are formed when two tectonic plates collide and one piece of the crust sinks under the other, creating a kind of chasm. Challenger Deep lies at the southern end of the trench, near the island of Guam.

A Sci-Fi Landscape at the Deepest Part of the Ocean

This area of the ocean floor more closely resembles something from a science fiction novel rather than any other landscape on Earth.

James Cameron's *Deepsea Challenger* touches down at Challenger Deep in 2012

Image by Mark Thiessen/National Geographic Creative

Underwater vents cause liquid sulfur and carbon dioxide to bubble up from the crescent-shaped vent. No natural light penetrates at the depth of the trench and temperatures are only a few degrees above freezing.

The water pressure at Challenger Deep is an astounding 1,000 times greater than the pressure at sea level. Yet despite the crushing pressure, frigid cold, and eternal darkness, life manages to exist.

The crew of the 1960 expedition miraculously spotted a fish at Challenger Deep during their dive, proving for certain that life could exist in such a place. As Piccard later said:

"And as we were settling this final fathom, I saw a wonderful thing. Lying on the bottom just beneath us was some type of flatfish, resembling a sole, about 1 foot [30 cm] long and 6 inches [15 cm] across. Even as I saw him, his two round eyes on top of his head spied us — a monster of steel — invading his silent realm. Eyes? Why should he have eyes? Merely to see

?

IF YOU DROP A YELLOW HAT IN THE RED SEA, **WHAT DOES IT BECOME?**

phosphorescence? The floodlight that bathed him was the first real light ever to enter this hadal realm. Here, in an instant, was the answer that biologists had asked for the decades. Could life exist in the greatest depths of the ocean? It could! And not only that, here apparently, was a true, bony teleost fish, not a primitive ray or elasmobranch. Yes, a highly evolved vertebrate, in time's arrow very close to man himself. Slowly, extremely slowly, this flatfish swam away. Moving along the bottom, partly in the ooze and partly in the water, he disappeared into his night. Slowly too — perhaps everything is slow at the bottom of the sea — Walsh and I shook hands."

It has been speculated, however, that the fish the team spotted was actually a sea cucumber because most scientists theorize that a vertebrate organism could not survive at such crushing pressures. Sea cucumbers and other microorganisms have been found in other parts of the Mariana Trench, where they are able to subsist off of the methane and sulfur from the vents on the ocean floor.

Recent data does show that some microorganisms have been shown to live at Challenger Deep.

A History Of Explorations

Although humans have been navigating the seas for thousands of years, "the reality is we know more about Mars than we know about the oceans," marine biologist Sylvia Earle explained. It was only relatively recently that ships' crews began to concern themselves with the depths of the ocean rather than just its surfaces.

In 1875, the British ship HMS *Challenger* set out on the first global marine research expedition. Her crew was the first to discover the Mariana Trench and, using the rather primitive equipment of a weighted sounding rope, measured its depth to be about 4,475 fathoms, or 26,850 feet.

Nearly 75 years later, a second British ship, the HMS *Challenger II* returned to the same location and was able to explore the deepest part of the trench using the more advanced technology of echo sounding. This time, they recorded a depth of 5,960 fathoms, or 35,760 feet.

It is from these two ships, the first to map out its location, that Challenger Deep takes its name. In 1960, not even a century after its discovery, the American team was able to reach its bottom.

Humans would not reach the floor of Challenger Deep again for over five decades. Although two unmanned submarines were sent on separate expeditions in 1995 and 2009 (one Japanese and one American), it was not until director James Cameron of *Titanic* fame plunged the depths in his own expedition that a manned vehicle would reach the bottom.

James Cameron's Expedition To Challenger Deep

Cameron became only the third person in history (and the first person solo) to reach and explore Challenger Deep.

Over the course of seven years, Cameron developed his own personal submarine with the help of a team in Australia and the sponsorship of National Geographic. The vessel's pilot sphere was so tiny that Cameron was unable to fully extend his limbs during the several hours he spent submerged.

Unlike his predecessors, it only took the director about two and a half hours to descend the nearly seven miles to Challenger Deep. Also in contrast to the previous manned expedition to Challenger Deep, Cameron's vessel was equipped with arms to take samples from the ocean floor, as well as 3-D video cameras.

In 2014, Cameron released the film *Deepsea Challenge*, which consisted mainly of the videos he had taken on his expedition to Challenger Deep.

The extraordinary footage made the most mysterious place on the planet accessible to thousands of people, bringing the black, cold depths of the deepest ocean vividly to life like never before. ●

Edited for space and clarity

?

THE HEAD OF A WHALE IS SIX FEET LONG; HIS TAIL IS AS LONG AS HIS HEAD AND HALF HIS BODY, AND HIS BODY IS HALF OF HIS WHOLE LENGTH. **HOW LONG IS THE WHALE?**

riddles.com

RANDOM-NEST

The Seven Seas in Ancient and Medieval Europe

BY JESSICA KARPILO | THOUGHTCO.COM | UPDATED APRIL 10, 2019

This list of the seven seas is believed by many to be the original seven seas as defined by the sailors of ancient and Medieval Europe. The majority of these seven seas are located around the Mediterranean Sea, very close to home for these sailors.

1) **The Mediterranean Sea** | This sea is attached to the Atlantic Ocean and many early civilizations developed around it, including Egypt, Greece, and Rome and it has been called "the cradle of civilization" because of this.

2) **The Adriatic Sea** | This sea separates the Italian peninsula from the Balkan peninsula. It is part of the Mediterranean Sea.

3) **The Black Sea** | This sea is an inland sea between Europe and Asia. It is also connected to the Mediterranean Sea.

4) **The Red Sea** | This sea is a narrow strip of water extending south from Northeast Egypt and it connects to the Gulf of Aden and the Arabian Sea. It is connected today to the Mediterranean Sea via the Suez Canal and is one of the most heavily-traveled waterways in the world.

5) **The Arabian Sea** | This sea is the Northwestern part of the Indian Ocean between India and the Arabian Peninsula (Saudi Arabia). Historically, it was a very important trade route between India and the West and remains such today.

6) **The Persian Gulf** | This sea is a part of the Indian Ocean, located between Iran and the Arabian Peninsula. There has been dispute as to what its actual name is so it is also sometimes known as the Arabian Gulf, The Gulf, or The Gulf of Iran, but none of those names are recognized internationally.

7) **The Caspian Sea** | This sea is located on the Western edge of Asia and the Eastern edge of Europe. It is actually the largest lake on the planet. It is called a sea because it contains saltwater.

WORDS OF ENCOURAGEMENT

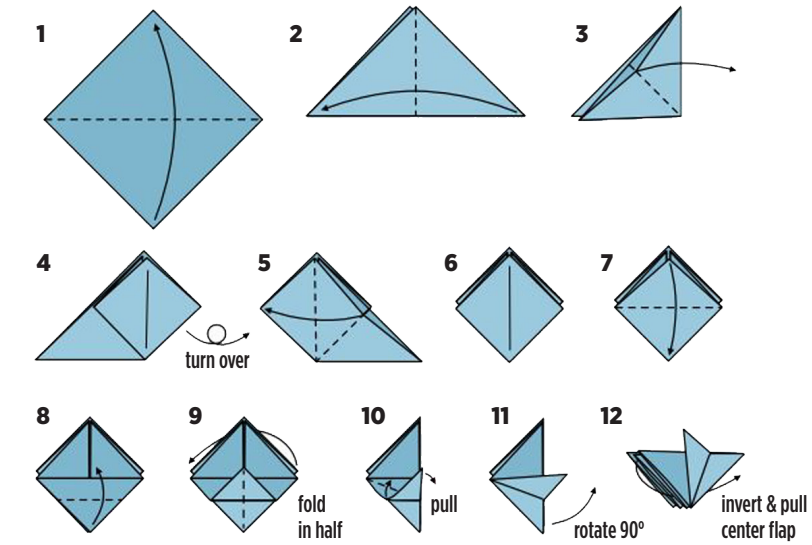
Just think about how deep the ocean gets, and try to place yourself in that space. The Chinese sub Fendouzhe just went to an underwater depth of 35,791 feet a few weeks ago. The ocean is scary at only 7 feet, let alone 7 miles. I remember snorkeling for the first time in clear ocean water. It was immediately intimidating to be able to see anything — I was used to murkier Alabama lakes, and was exploring a remarkably calm area of Florida. Initial fear flipped into curiosity — I could see tiny, striped fish biting my toes! It didn't hurt, but I suddenly understood the gentle bumps that I had just ignored before. I avoided clumps of seaweed at the bottom. I would float above, but couldn't see what was inside, so I'd stay around the edges of these underwater islands. After spotting camouflaged fish and crabs working through the complex plants, curiosity got me again. I'd float and watch for hours, forgetting the old apprehension.

I find myself in a strange conversation with the ocean. Are the waves too big to paddle out in a kayak? The danger is real. I'm not thrill seeking — I just want to see and understand what I don't already know. It means something for me to go through this process, and it adds value to the peace I feel once I'm on the other side of my fear. Again and again, the ocean has provided that experience for me. Even when I imagine a scientist inside of a machine deep within the Mariana Trench, it calls out to something inside of me — terror matched by curiosity.

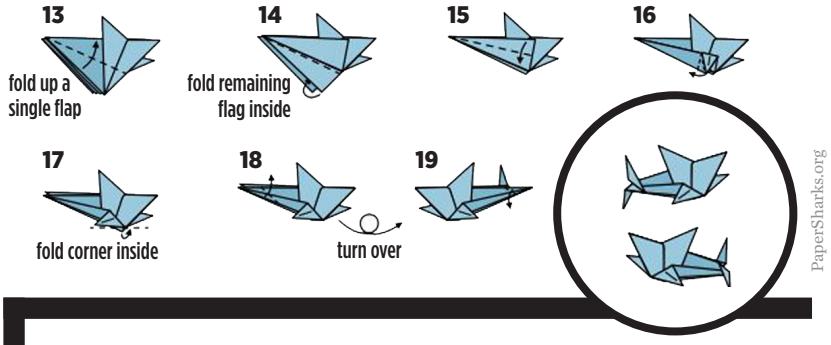
The ocean has no personality, but I often impose human traits onto that complex series of forces. When I look into it, the reflected thoughts are mine, but nature does also speak its own language. As an artist, seeing relates to understanding; this prompts questions about reality, identity, and my place in the world. If I can personify nature, can it "ocean-ify" me? It is difficult to see the ocean, in its entirety. Waves crashing violently against a rock, kicking 30 feet into the air, or a gently repeating "lap-lap-lap" that barely shakes the sand; these bodies of water are connected across the planet, and are only truly separated by our drawn lines. My mind may not be able to grasp the ocean, but I do like how it challenges me to get out of my comfort zone.

Jamey

HOW TO MAKE AN ORGAMI SHARK



REPEAT STEPS 13-17 ON OTHER SIDE



PaperSharks.org

Answers

SUDOKU #71

2	6	9	7	8	3	1	5	4
5	3	8	9	4	1	6	7	2
1	7	4	5	2	6	3	8	9
8	9	3	2	5	7	4	1	6
7	1	6	8	3	4	2	9	5
4	5	2	1	6	9	7	3	8
9	8	7	6	1	2	5	4	3
6	4	5	3	7	8	9	2	1
3	2	1	4	9	5	8	6	7

SUDOKU #72

2	9	4	1	3	7	5	8	6
7	1	6	4	5	8	3	9	2
3	5	8	6	9	2	7	4	1
5	2	9	3	7	4	6	1	8
8	3	7	9	1	6	4	2	5
4	6	1	2	8	5	9	7	3
9	8	5	7	2	3	1	6	4
6	7	2	5	4	1	8	3	9
1	4	3	8	6	9	2	5	7

Brainteasers

Page 3 A message in a bottle
Page 6 Rebus Puzzle 1) Within reason 2) Three wise men 3) Bags under the eyes
Page 7 A wave; A tissue
Page 8 Wet
Page 9 48 feet

Send ideas and comments to:

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